AudioSpark – Audio Production & Engineering Learning Application

Final Report

George Sideris

IUPUI MSMT

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Introduction

With increasing advancements in the availability of technology for music, professional music production may be accomplished anywhere with as little as a laptop and a pair of headphones. To improve ability, users may find free tutorials and lessons online on services such as YouTube, alleviating the need to attend a formal physical or online school. Although there are many free online tutorials on the fundamentals of music production, without a sense of organization between the tutorials, many beginner producers end up lacking knowledge of major topics crucial to advancing to intermediate and advanced levels of production. Knowledge of the fundamentals of recording, producing, mixing, and mastering will give a novice producer enough of a foundation to advance to a higher quality and level of production and the ability to seek out more advanced learning topics.

The availability of technology and access to materials online expands the reach and variety of information. Learning materials have the ability to integrate aural, kinesthetic, and visual methods. By using all three learning methods, students will achieve a higher rate of information retention, learn with their preferred learning method, and get practice performing common tasks. Services like YouTube do not have means of creating interactive exercises, but interactive websites are easily created with free templates.

Creating a learning application to provide and develop practical information and skills in audio engineering and music production using multiple learning methods will give beginner music producers a more powerful foundation of music production and the ability to pursue studies into more advanced

production topics (Denig, 2004). The application will provide access to a formal set of information and interactive exercises to give students the ability to learn a basic, but usable skillset in recording, producing, mixing, and mastering audio projects, as well as improve the quality of all audio engineering projects.

Purpose

The purpose of this project is to create an interactive application for beginner and aspiring music producers to gain a fundamental understanding of the processes and stages in music production. The learning materials will be in the form of videos, text, and interactive exercises. The application will be built using HTML, CSS, and JavaScript.

In addition to the content of this project, a heavy emphasis will be placed on the user interface and design. Having a smooth transition between each topic, page, and exercise will help users be more comfortable using the course. By having a good user interface and design, the course will have a visual and kinesthetic appeal to the users. User surveys and testing will greatly help improve the design and flow of the course.

The course will contain four main topic areas with subtopics. The topics are recording, producing, mixing, and mastering. Recording will cover the basics of recording using direct inputs, microphones, and MIDI. Producing will discuss common audio effects and how to individually process sounds. Mixing will cover the process of creating a clean, clear, and balanced overall mix of instruments, as well as the practice of automating parameters. Mastering will overview effects

used to finalize music, make a commercially viable end result, and introduce some industry related cataloging items.

Each main topic will have a video overview and text explaining the facets of the topic. The overview video will explain the importance of the topic in the sequence of materials, as well as introduce terminology and overviews of the subtopics to come. The text will include similar information to the videos, but will elaborate on terminology and common industry related practices.

Each subtopic will have a video, text, and at least one interactive exercise. The subtopic videos will be in-depth lessons covering all major facets of the subtopic, as well as step-by-step uses. The text will include the same material as well as some special topics. The exercise builds will depend on the topic, but will require the user to engage with and use the information gained. With a table-of-contents style navigation, users will be able to easily return to course material and exercises in the future in case they want to revisit a topic.

Giving the users multiple learning methods per topic appeals to a larger audience, as there will not be limitations on understanding due to a lack of one learning style (Denig, 2004). When users do not have access to materials in their preferred learning style, it may decrease the information retention. By implementing practice exercises for each topic, the user will be able to use and apply what is learned.

Once this course has been tested and finalized, the framework may be used to create other courses in the future, whether music production related or not. The course frame will be easily manipulated to other topics, as most pages

will be drag and drop for content. The frame will capable of being reused in the future, so the value isn't solely for learning music production.

Review of Literature

With advancements in the availability of information through technology, learning has taken new forms outside of the traditional classroom setting. Students may watch videos, do interactive exercises, read tutorials and explanations, and listen to lectures on the Internet from home. Since modern technology allows various forms of media, multiple learning styles are available to each student.

A learning application on the foundations of music production should contain multiple methods of learning and interacting for each exercise, giving a higher potential rate of retention. By mixing multiple forms of media, "technology tools have the ability to address students' learning needs in terms of learning style preferences, as students work as individuals and groups to construct knowledge" (Solvie & Kloek, 2007). Solvie & Kloek's study concluded that students using technology will gravitate towards their preferred learning methods, though giving access to multiple forms helped "students develop the ability to adapt to new learning tools, situations, and contexts."

According to the research of Stephen Denig, "each learner has a primary learning style, and can be taught how to study and concentrate capitalizing on that style." "However, most learners also have a secondary style, which can be used to reinforce initial learning effectively" (Denig, 2004). This is further

evidence that using multiple learning styles will give a higher potential for information retention, and effectiveness. Even though a student may have a primary learning style, there will be a great benefit to including visual, aural, and kinesthetic content, as it will introduce more perspective on each topic. Denig's research on Dun & DeBello's research study in 2000 concluded that "when academic underachievers were taught new and difficult (for them) content through instructional approaches that responded to their learning style strengths, they achieved statistically higher" (Denig, 2004). Even students who are not typically high achievers gained more knowledge when multiple learning styles were used instead of traditional ones. In Ronald Schmeck's book *Learning Strategies and Learning Styles*, he states, "personal characteristics influence perception of the situation, and the stability of those characteristics account for cross-situational consistency in behavior" (Schmeck, 1998). By giving students multiple methods of learning styles in the content of an online course, the students may pick and choose how they will learn based on preference.

Some web courses offer the flexibility of being taken asynchronously. According to the research of D. Randy Garrison, "asynchronous online learning can create a rich cognitive presence capable of supporting effective, higher-order learning" (Garrison, n.d.). This project proposal intends to create a learning environment that does not require students to attend lectures synchronously, as it provides a greater amount of flexibility. Garrison's research concludes asynchronous online learning is most effective when students are given the

opportunity to reflect upon the material and to share their own ideas (Garrison, n.d.). ""Students need to be "hooked on a big idea" (Prawat, as cited in Garrison, n.d.) if learners are to be motivated to be reflective and self-directed in constructing meaning" (Garrison, n.d.). Although online asynchronous learning is a convenient method for instruction, Ji-Hye Park's paper given at the International Research Conference in The Americas of the Academy of Human Resource Development in 2007 discusses high dropout rates. "This study found that time conflict was the most frequently cited barrier to persistence in distance learning because most learners are working and studying at the same time" (Park, 2007). That being said, the study focused mainly on education for employees to gain skills, not students who are making time to learn a new trade.

With the availability of media on the Internet, there are multiple methods in which students may partake in learning with both formal and informal options based on course availability. WebCT was one of the first formal distance learning environments, developed by Murray Goldberg in 1996 (Bates, 2005). "With the rapid expansion of online learning has come a rapid expansion of different forms of online learning" (Bates, 2005). Students may attend video lecture streams and interact with the instructor by means of text chat, voice, and indicator buttons. Learning materials may include "a single graphic or paragraph of text, a single slide of a physiological cell, a self-assessed test, a simulated laboratory experiment, or a short module of teaching" (Bates, 2005). "Where careful comparative studies have been made, students learning at a distance through online learning do as well as students taking the same courses face-to-

face" (Bates, 2005). Since online learning does not have a negative impact on learning, it seems that online learning may be a more optimal environment, as there are more possibilities for students to learn by means of their preferred learning style. For instance, it may be more effective for a kinesthetic learner to do mathematics exercises online than sit through a lecture.

An informal service like YouTube contains thousands of free, user-created tutorial videos and lessons from very basic to advanced topics. "In a recent survey of over 1,000 participants, I have found that short videos of 1-4 minutes are ideal (Bonk, 2011). Bonk's research discovered content that was humorous, informative, current, interesting, and engaging was preferred by viewers, and viewing typically occurred between 6pm and midnight.

> There are more educational videos available online than we first imagined. For the week on behaviorism, my students found documentaries on B. F. Skinner's life (see Appendix B). In addition, there was also one on operant conditioning wherein a rat performs a series of tasks to obtain a reward. While such information can personalize learning and make ideas come to life for students, humorous videos related to behavioral concepts are also powerful. For instance, in the popular sitcom, The Office, there is a YouTube video wherein Jim gives Dwight a mint every time a computer reboots and eventually Dwight holds out his hand for a mint when he hears the sound. (Bonk, 2011)

Bonk's research suggests YouTube may be used to study complex topics, even though it is not a formal learning environment. Videos relating learning

topics to popular subjects, such as The Office, helped students better connect with the material. “The use of video in instruction is now on demand, highly flexible, AND can anchor most any lecture or course activity” (Bonk, 2011). A great upside to using YouTube videos for learning is that they are free, but the downside is that information may not always be accurate, as there is no fact checking outside of the user community’s comments. “Video is a powerful medium for capturing and holding attention and for conveying impressions” (Moore & Kearsley, 2012).

With the ability to learn online both synchronously and asynchronously by means of lectures, videos, text, exercises, and activities, students can learn new skills, subjects, and techniques without the needing to leave the house or go to a formal institution. With respect to learning music online, Janice Waldron’s journal article titled *Locating Narratives in Postmodern Spaces: A Cyber Ethnographic Field Study of Informal Music Learning in Online Community* discusses how two people learned to play Bluegrass music by means of an Internet community called Banjo Hangout. In this informal learning environment, members have access to video lessons, forum discussions, and professional players for support to learn to play Bluegrass (Waldron, 2011). Another example of available instructional media is Cathy Moore’s YouTube video series teaching the banjo, where she teaches both the fundamental techniques of the instrument as well as how to play songs (Waldron, 2011).

In music production, learning online is available by several schools, accredited and not. There are courses ranging from well-known music schools

such as Berklee College of Music (http://berkleeonline.com/) to lesser-known, specialized schools like Dubspot (http://dubspot.com/). Berklee and Dubspot both have all-encompassing courses on music production foundations. Berklee, Dubspot, and other similar online programs contain various forms of media for student instruction. Unfortunately, there is a large price tag on those options. By creating an audio production learning application, students will have an affordable option to formal classroom learning. As for the content, discussing the facets of the audio engineering and production process as they arise will give a storytelling approach with practical and usable skills. “Students can begin by learning the art of mixing, and then learn to create their own material on computer, which they can mix in with the commercial material” (Finney & Burnard, 2007). Unlike formal music education, especially instrument-based, music production curriculum is typically created in such a way that students may follow their own paths and genres (Finney & Burnard, 2007).

A facet of online learning that has grown with the availability of more powerful mobile devices and widespread Internet access is the use of mobile applications. “The evolution of today’s mobile devices increases the number of mobile applications developed, and among them the mobile learning applications” (Pocatilu, 2010). With this availability of technology, mobile learning applications can increase both asynchronous and synchronous learning potential. “Instructional designers and educators realize the potential of mobile technologies as a learning tool for students and have incorporated them into the distance learning environment” (Park, 2011). Mobile distanced learning is more

common in both formal and informal learning environments (Park, 2011). Since mobile technology increases the availability of information at any given time, mobile learning strategies can be powerful tools to develop. “Mobile learning has been defined as learning that takes place via wireless devices as mobile phones, Personal Digital Assistants, or laptop computers” (Dochev & Hristov, 2006). Mobile learning technologies increase the time spent learning and studying due to location independence, according to Dochev and Hristov’s research.

Another major focus for learning applications is the user-interface. “User-interface design is a central issue for the usability of a software product” (Oppermann, 2008). The concept of usability is defined by the effectiveness, efficiency, and satisfaction of the user (Oppermann, 2008). User interface “manifests itself at a number of levels of contact between the user and the system: physical, conceptual, and perceptual” (Lee & Lochovsky, 1985). “It is said that the amount of programming code devoted to the user interface now exceeds 50 percent” (Galitz, 2007).

> “A screen’s layout and appearance and a system’s navigation affect a person in a variety of ways. If they are confusing and inefficient, people will have greater difficulty doing their jobs and will make more mistakes. Poor design may even chase some people away from a system permanently. It can also lead to aggravation, frustration, and increased stress.” (Galitz, 2007)

Galitz clearly emphasizes the importance of a clean, easy to use user interface. His research concluded that productivity due to clarity and readability

improved by about 20 percent when items were spread out among different lines and screens, instead of consolidated into one. The benefits of a good user interface do not stop at productivity and performance. Training costs may be lowered since training time is reduced and employee and student satisfaction can be increased due to the ease of use of an application (Galitz, 2007).

Creating a mobile environment with an effective user interface to teach the fundamentals of audio engineering gives an opportunity for students to asynchronously, but effectively learn usable skills and common terminology. With this research, it is very apparent that web courses and mobile applications, whether synchronous or asynchronous, are very effective education practices comparable to formal classroom settings.

Conceptual Design of the Project

The application will promote greater information retention by integrating kinesthetic, auditory, and visual media. By integrating video, text, and interactive exercises, students will have the ability to choose their own preferred style of learning, and will “develop the ability to adapt to new learning tools, situations, and contexts” (Solvie & Kloek, 2007). Though each student may have one preferred style, “most learners also have a secondary style, which can be used to reinforce initial learning effectively” (Denig, 2004). Students will be able to maximize learning potential and retention due to having multiple forms of media.

Since the course will contain multiple forms of media, it will be easier to have an asynchronous environment where students may participate as they

please, without regard to day and time. If in the future, it may make sense to incorporate an instructor or support person who the students may communicate with online for any questions and concerns. Asynchronous learning environments give much more flexibility to students. Though Ji-Hye Park's study on dropout rates showed higher rates among asynchronous learning for the workplace, this project will be a course on topic of interest, not a requirement for a formal school (Park, 2007). Creating a powerful course on a special interest topic will likely see higher rates of completion than required workplace training.

It makes the most sense for this course to be offered as a mobile application because it will have the ability to have continuous access and readily available media. The rate of success for online learning versus learning in a physical classroom was identical (Bates, 2005). Since there is no difference in student achievement between physical and online classes, this course is ideally taught from a mobile device, as it is much easier to have asynchronous available media. This also opens up the possibility for having an unlimited number of students using the application, where website hosting space and bandwidth would not be factors. Initially, the application will be developed for iPad, but upon completion may be modified for other mobile devices.

This course will have four main topic areas, each with relevant subtopics, to cover the fundamentals of music production. The goal of the course is to help beginner and novice music producers fill in gaps and build a foundation in which they can expand upon. The course will also be useful for students who have no knowledge of music and musicians who want a better idea of what goes into it.

Project Content

Initially, the course was designed to contain five main topics: the overall production process, music theory, the principles of sound, audio processing & effects, and common DAW functions. To take an approach that incorporates the actual step-by-step processes used in the industry, it made more sense to cover topics as they surface during a common music project timeline. Music theory and composition were dropped because the amount of content required, even for a basic understanding, could fill another course or more; the topics do not directly pertain to audio engineering practices.

The video sections, both in main topics and subtopics, will first overview the topic, and then give a step-by-step walkthrough on how to perform tasks. Text sections will contain the same information, but will contain greater detail, terminology, definitions, and some insight on more advanced usage. Exercises will be practical activities unique to content topics.

Covering recording, producing, mixing, and mastering will give insight into how each step builds the entire music production process. Recording will discuss both the hardware and software requirements for various methods of recording. Subtopics will go into detail on recording using direct inputs, microphones, and MIDI, as well as step-by-step processes on how to perform each method. The producing section will overview audio effects and processing methods commonly used in audio engineering. Subtopics will discuss common audio effects and uses in a production environment. Mixing overviews the practice of creating a clean, balanced overall instrumental mix. Subtopics include more refined effect

processing, parameter automation, and project. The mastering section will discuss the process of making a project commercially viable, including mastering effects, export procedures, and metadata.

Though the course will give practical, useable practice, the intent is not to make professional producers upon completion. It will operate on the idea that students will practice what they learn and will research new techniques to expand on their knowledge. The goal of the course is to build a powerful foundation on which users, upon completion, will be able to continue with self-study. This also leaves room to offer more in-depth, subject-specific courses in the future if the course is successful.

Project Sequence and Layout

The application, named AudioSpark, will portray content in a linear fashion, similar to an e-book, with table-of-contents menu for users to easily jump between topics. By keeping the content in a linear fashion, it promotes a practical order of information. Users will learn to perform common tasks during each content section.

The initial sequence and layout of the application was designed to compartmentalize all subtopics under main topics so a user would have to navigate a more complex user interface. The original user interface design can be found in Appendix 2, Figures 1, 2, and 3. The original content map of the application can be found in Appendix 1, Figure 1, and the original user flow diagram is in Appendix 1, Figure 2.

The new iteration of the user interface design may be seen in Appendix 2, Figures 4 through 8. The reason for the design and content changes was primarily to create a simple, smooth experience for the end-users. The initial design had too many interactions with the navigation to achieve a small task. By creating a simpler user interface in which pages may be changed either using a swipe gesture, or pressing left and right buttons, the user has less work to turn pages. To navigate directly between topics, a user may also choose to use a table of contents menu opened by the press of a button at the top left of the screen. The menu will open out and show main topics listed. If a user presses a main topic, the list of subtopics for that section will appear indented beneath the main topic. By pressing a subtopic, users will immediately be taken to the chosen page.

The application design of the course and the course materials may be created simultaneously. The learning content will require creating and capturing text, video, images, and interactive exercises. The course framework will require HTML, CSS, and JavaScript programming. Once the initial application framework has been built, it can be packaged and tested on an iPad app by purchase of an Apple Developer account, xCode software, and Cordova software.

To market the application prior to the launch, a website will be created as a landing page to collect emails, give initial information, and eventually house promotional materials that show the usage of the application. A public forum may be added in the future to create a system in which users may answer the

questions of other users. The landing page may be found at http://audiosparkapp.com/

Project Tools and Resources

For the course framework, a computer will be needed to write code in JavaScript, CSS, and HTML. HTML will be used to create the basic layout of the course, CSS to style it, and JavaScript to create interactive pieces. Each page of the course will be in a separate HTML file, and a main navigation system will load the pages in the proper order according to a JavaScript Object Notation (JSON) file. A user flow diagram may be found in Appendix 1: Diagrams, Figure 4: Updated User Flow Diagram. To keep device memory costs low, the application will implement a method in which it will only load the content of 3 pages at a time. For instance, if the application is loaded to page A, pages A, B, and C are filled with content. If a user swipes to page B, pages A, B, and C still have content. If a user swipes to page C, page A is cleared of content, and content is filled on pages B, C, and D. To assist the horizontal page scrolling mechanism, a free, open-source JavaScript library named iScroll will be implemented.

The course content will contain videos, text, and interactive exercises. Video media will be recorded using ScreenFlow, a piece of software intended for screen recordings, and a video camera. Videos will be edited using Adobe Premiere Pro. The text documents will be initially written out in Microsoft Word and transferred into HTML documents, and images for the text documents will be sourced from stills of the recorded video. The interactive exercises will be built

using JavaScript and JavaScript libraries. The exercises will be based on the topic addressed.

The end-user will need to have an iPad, before other device availability, with access to the Internet or the iTunes store. Access to studio quality headphones will be optimal, but the course will still be usable with onboard speakers. Ideally, the users will also have access to a Digital Audio Workstation to practice the course material.

In addition to the author, supplemental guidance will be needed for coding, videography, and video editing. The author has some background in JavaScript, HTML, and CSS, but may need assistance when it comes to the interactive exercises and a more attractive user interface. Videography and Video Editing will be learned using Udemy, an online learning platform with many courses instructed by professionals.

Pilot Study

Initial Survey

To discover if a course in the fundamentals of music production is a project that is worthwhile, specific questions must be addressed amongst music producers, especially ones who have used the Internet as a learning tool. An online survey was given to 20 music producers of various skill levels and knowledge. The survey was given on https://vividkind.com/, the company owned by the author.

The survey began with checking the learning preferences of music producers. All 20 music producers preferred self-paced learning, 4 preferred a formal school setting, 4 preferred private lessons, and two preferred learning on YouTube. The survey asked music producers to state various preferred methods of learning in a text box; 7 participants chose to learn by trial and error, 7 by tutorials, 6 with a mentor, 6 in a group or classroom setting, and 4 with formal repetitive practice with lesson-specific materials. All 20 participants watch tutorials online; 17 participants use YouTube and 4 use ADSR (a website with tutorials and audio samples). A few other online tutorial locations were mentioned, but not more than once, and some of those locations were YouTube channels.

10 participants stated they have been producing music between 1 and 5 years, 9 stated over 5 years, and 1 has been producing for less than one year.

To discover if there were specific topic areas where participants lacked knowledge, participants were asked to check boxes of specific topics in Music Theory, the overall music production process, effect devices, and common DAW functions. First, participants were asked if they were comfortable with music theory based on a scale. One participant stated music theory mastery, 6 were fluent, 7 knew enough to get by, 4 are not comfortable, and 2 do not know music theory at all. 12 were comfortable with scales, 13 with chords, 15 with rhythm, 6 with notation, 14 with basic piano, and one participant stated not being comfortable with any aspect of music theory, though this participant also

answered “I know enough to get by” for the prior question. 11 participants have used the Internet to learn music theory.

Regarding music production topics, 9 were comfortable recording, 18 composing, 18 producing, 14 mixing, and 5 mastering. 20 were comfortable using EQ and Filters, 18 with compressors, 11 with Noise Gates, 18 with Reverb, 18 with Delay, 17 with Delay-Based Effects, and 14 with Distortion. 16 of the participants have used the Internet to learn how to use audio effects.

15 participants use Ableton Live as a DAW, 4 use FL Studio, 1 uses Cubase, 1 uses Reason, 1 uses Logic Pro, and 1 uses ProTools. Regarding DAW functions, 11 are comfortable with the transport functions, 18 with channel types, 19 with panning, 18 with using effects, 20 with automation and modulation, 15 with recording audio, 19 with editing audio, 17 with recording MIDI, and 19 with editing MIDI. All 20 participants stated they would be able to use another DAW if they knew were the DAW’s controls were located.

In addition to the knowledge level of participants, understanding their online learning habits, whether formal or not, will assist in determining if a web course in the fundamentals of music production is worthwhile. 11 participants stated they have taken an online course. Of those 11 participants, they enjoyed having readily available material, the convenience of online content, the ability to learn at their own pace, visual instructional materials, and access to a lot of information both in and out of the course. Those participants did not like the lack of an instructor, lack of feedback, lack of course structure, some tutorials had too much information in too short of time, lack of human interaction and alienation

with complicated questions, off-topic questions were ignored, topics were explained more than shown, and a lack of tailoring material to individual knowledge and strengths. Of the 9 participants who have not taken an online course, 8 of them were interested in taking one in the future.

To discover the preferred learning styles of participants, the survey asked participants to check boxes of Audio, Video, Interactive Exercises, Written, and Other. 13 participants chose Audio, 19 chose Video, 20 chose Interactive Exercises, 10 chose Written, and no participants chose other. Participants were asked to type any other course materials they would prefer in a fundamentals of music production course that were not covered in the survey in a text box. Acoustics and sound design had multiple requests amongst responses, as well as industry and business advice. One participant mentioned the fundamentals of digital sound should be included (i.e. What is Bit Rate?). Some participants did not understand or did not read the question, as some responses were topics covered in the survey. The survey given may be found in Appendix 4: Pilot Study, Figure 1: Initial Survey Questions.

Initial Survey Conclusions

The knowledge participants stated in their answers did not correlate with the amount of time spent producing music. It seems that there is not a constructive informal place to learn all aspects of music production to a comfortable degree for both novice and intermediate music producers, though there are many available free videos online. The music producers who had received a formal education were certainly more comfortable with more of the

topics discussed in the survey. There were varied answers for those who chose self-paced learning exclusively, so it shows an opening for an all-inclusive course. For the most effective course model on the fundamentals of audio engineering and production, a course must contain video, text, interactive exercises, and a forum for students to discuss topics as well as receive feedback from experts and instructors. Including all of these materials will have a more interactive and friendly environment amongst students. Since all participants stated interactive exercises were preferred, it would be in the best interest to make sure exercises are implemented, as it will give opportunity for students to better retain information.

Most participants of the survey were comfortable with composition and production, but only half of those participants were comfortable with recording. Those who stated they were knowledgeable about mixing had discrepancies with what effect devices they knew how to use, and DAW functions they knew how to perform. Participants stated different answers between the question on Music Production techniques, where only 9 stated being capable of recording audio, and the question about the comfort of DAW topics, where 15 stated recording audio was comfortable. It is very apparent that informal online learning environments are not properly covering the fundamentals of music production in a way that students can confidently perform common tasks and techniques. This is further proven where 18 participants stated understanding the process of production, and answers varied amongst DAW function comfort. It appears music producers aren’t given a full overview of each topic related to music production,

thus there is a place in the market for a course on audio engineering and production that includes multiple learning methods.

Since sound design and acoustics were mentioned multiple times as topics to include, it seems that the possibility for future courses exists, as both are very complex. Sound design topics may include wave shape types, an overview of the major and common types of synthesis, and forms of modulation. Acoustics should discuss basic sound physics, room frequency calculations, speaker placement, and basic, affordable treatment options.

Though multiple participants requested topics in music business and brand development, it would make more sense to have an entirely separate course on the subject, as it is not a directly relevant topic to music production, though it is an important subject area. Notes on the initial survey responses may be found in Appendix 4: Pilot Study, Figure 2: Initial Survey Answer Notes.

Project Evaluation Plan

Upon completion of a working model of the fundamentals of music production web course, two evaluations will be made: a UI evaluation and a content evaluation. The User Interface evaluation will be designed to ensure that the course works and that it is comfortable to navigate. The User Interface analysis will be sent first to 2 to 3 application or web designers and 2 to 3 novice users. Based on the feedback, alterations may be made.

Content will be evaluated in a similar fashion. Two to 3 professional music producers and 2 to 3 beginners will be surveyed on the content materials and

structure of the course. A separate survey will be given on each major topic area (Recording, Producing, Mixing, and Mastering) to better evaluate each section.

A forum may be implemented on the landing page for the course. The User Interface survey and the Project Content survey may be found in Appendix 5: Project Evaluation.

Timeline

The application design and the content design can be completed in parallel, as the initial application design will take less time than creating all forms of content. The entire project should take approximately 8 months. Upon completion of the full application, user testing will occur to determine any changes to be made.

The first iteration of the application was to be built in approximately 4 months, but it was not a realistic timeline for both the interface and the content. The initial timeline can be seen in Appendix 3, Figures 1 and 2. The updated timeline, Appendix 3, Figures 3 and 4, begins in May of 2017 and ends in early 2018.

The main user interface design for AudioSpark will occur between May 1, 2017 and August 7, 2017. This design phase will include building the main navigation, page changing functionality, and the table of contents menu. Once the major functionality has been created and tested, the styling of the user interface will begin. The user interface will be packaged as an iPad application at this point for developer testing on the device.

Content creation will begin in June 2017 for the Recording section. The recording section will be the main focus for completion to finalize the usability of the application. Once the main user interface and the recording section have been completed, promotional materials may be created and distributed. The Producing, Mixing, and Mastering sections will each take approximately one month, starting August 9th, 2017.

Upon completion of the content and the user interface, a period of user interface testing and content testing will occur. During this phase, novice and advanced users will use the application and answer survey questions to determine the quality of the content and user interface, and to help determine any changes that must be made prior to the full release of the application. This testing phase will occur between October 2017 and December 2017, and a revision phase will start January 2018, with a tentative release date in February 2018.

Future Work

As of July 29, 2017, the application is ready to package as an iPad application for developer testing. The content for the Recording section is completed and the user interface and preliminary exercises are functional. The website is prepared to show information about the application, minus screenshots and a video walkthrough of the application. Packaging the application and website images and video will be completed by August 6, 2017. The Producing, Mixing, and Mastering sections must still be created. These

sections will have more complex interactive exercises to give a more hands-on approach to specific topics. For instance, when discussing volume balance between instruments, a simulated mixer may be used for a user to put in practice how to create that balance.

Future content revisions will be considered for already created content and the creation of new content for unfinished major topics. The current video content for the Recording section could be revised, re-recorded, and edited for smoother, more captivating lessons. Background music may be added during overview information to help keep continuity between scenes and speech. Motion graphics may be used to create more captivating titles and on-screen text for a more professional, finalized look.

The text content may be revised to elaborate further into the principles of digital audio as they arise. For instance, this can include adding the mechanics of a microphone during the microphone recording section. The text section layouts can also be altered to better portray information. This will entail further research on instructional design.

The current recording section exercises require the user to place items in order in which they will be used. This concept can be expanded upon in the future to include a visually appealing, interactive design in which all of the devices are objects that simulate the real connections made in a studio. For instance, recording using a microphone may consist of a user placing a microphone, connecting a cable between it and an audio interface, selecting the proper input channel, and then arming the channel to record. This concept will

require much greater research and studies on JavaScript, JavaScript Canvas, WebAudio API, and other interactive coding resources. The appeal of an exercise in this manner is much greater than a simple list ordering exercise, but requires considerably more planning and coding.

A basic framework for an interactive glossary has been put in place, but is not yet functional. The idea is to have any keywords highlighted so a user may press the keyword and a definition bubble will appear on-screen. The glossary itself is built in a JSON file, and the concept is to have the application scan for any keywords on screen to highlight. A full glossary may also be added to the end of the table of contents menu.

As for the styled layout of the application, some changes may be implemented in the future for a more appealing and usable look. This may require outside help from a professional designer, as well as further research on instructional design layout, but will improve the end product. Upon full completion of the course, simple updates can be made to layout and code, but the content shouldn't be greatly altered unless a problem arises.

The public launch of the application should occur approximately in February of 2018, but it is based on the completion of the content and design of the application. A beta-testing period may be employed after the revision period to take on a larger scale of testers to collect further data on any errors, opinions, and usage patterns. Once the application has been publicly launched, the focus will shift to implementing it on other tablet devices with alternate operating systems, such as Android and Windows. A link to download the current source

code of AudioSpark is available in Appendix 5, Figure 2, and a link to the location where the final release will be available on the iTunes App Store is in Appendix 5, Figure 3. The promotional website and contact email are available in Appendix 5, Figures 1 and 4.

Based on the success and user-retention rate of the application, future applications may be created using the same application framework. The framework may be adapted for more in-depth courses on various topics that do not necessarily have to be about music. Ideally, the framework will be used for a relatively low friction mobile learning application of any topic.

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Appendix

Appendix 1: Diagrams

Figure 1: Original Content Flowchart

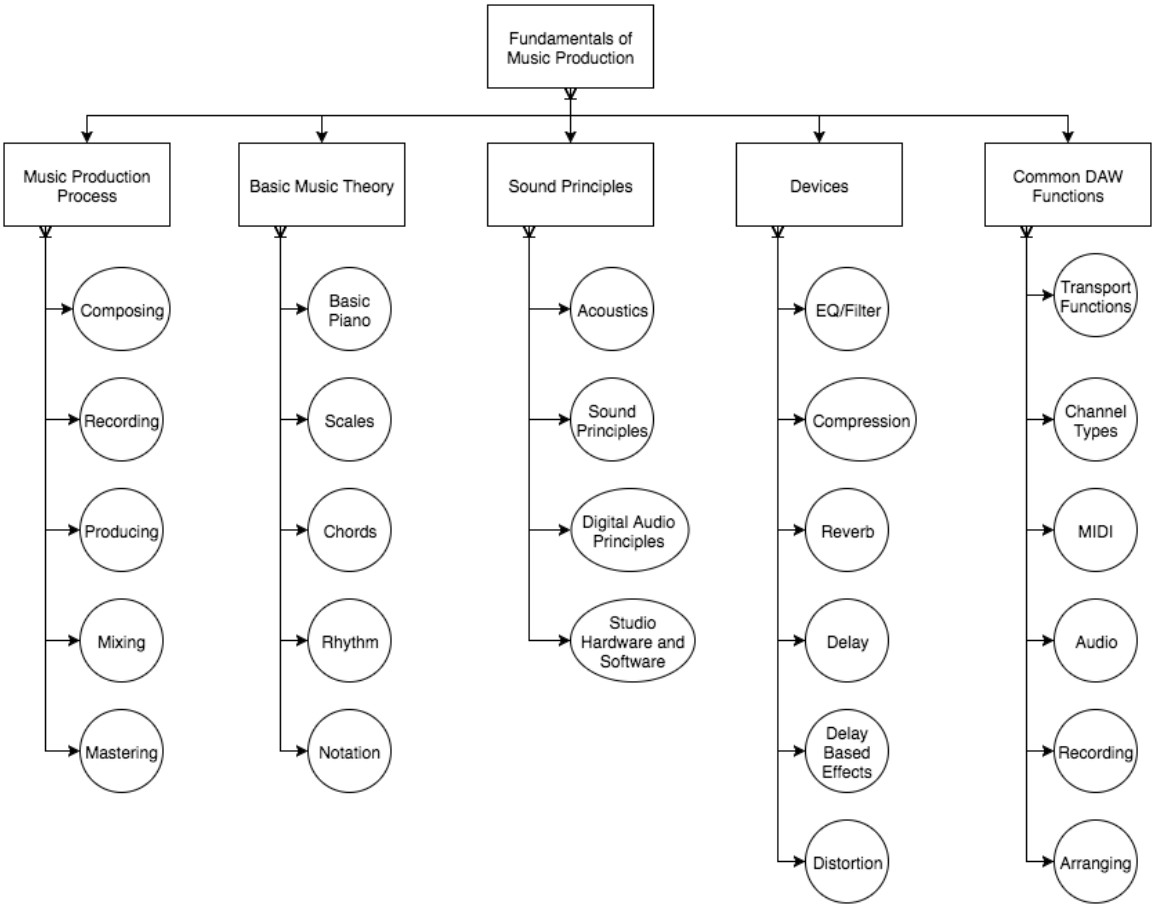


Figure 2: Original User Flow Diagram

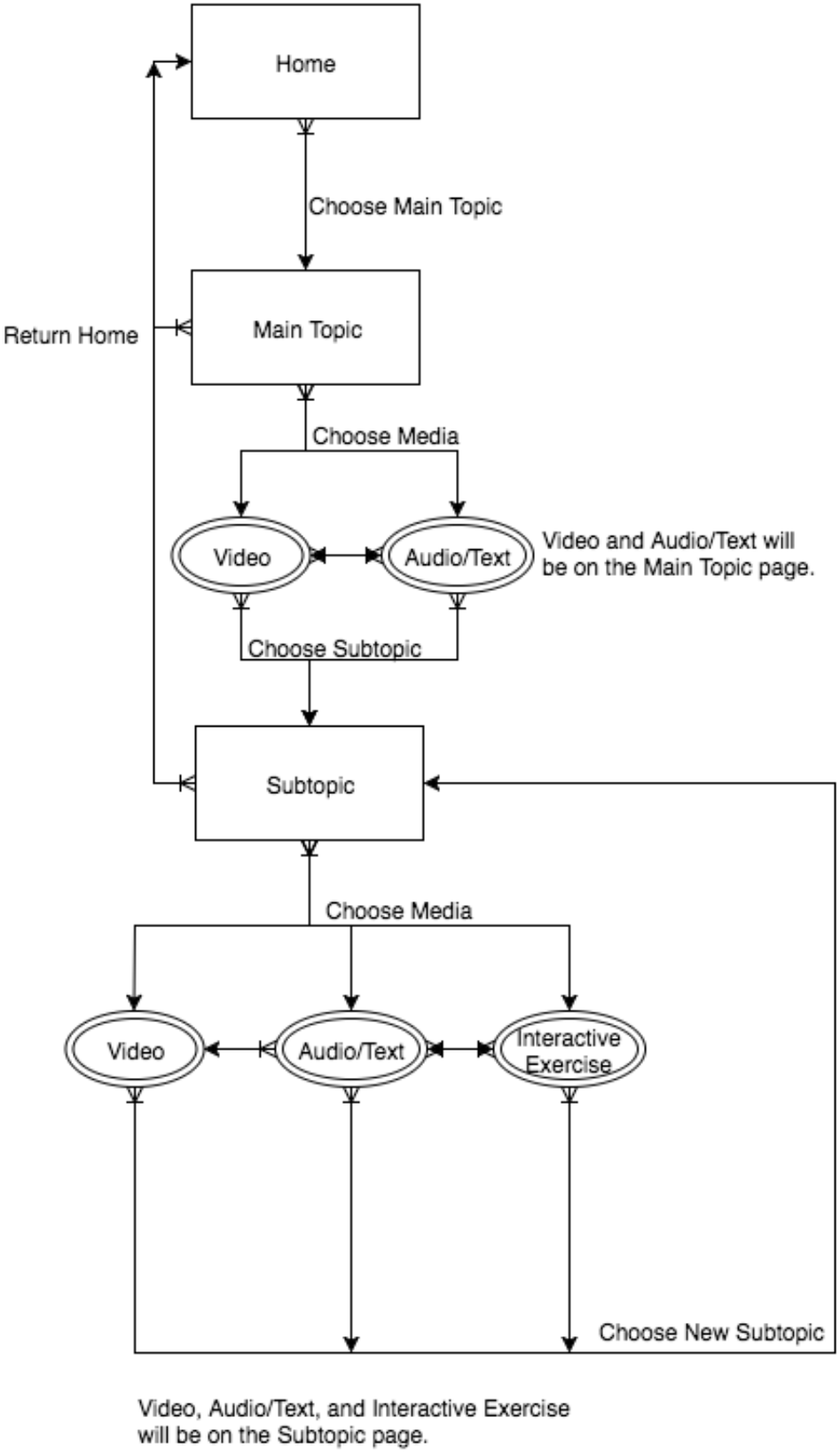


Figure 3: Updated Content Flowchart

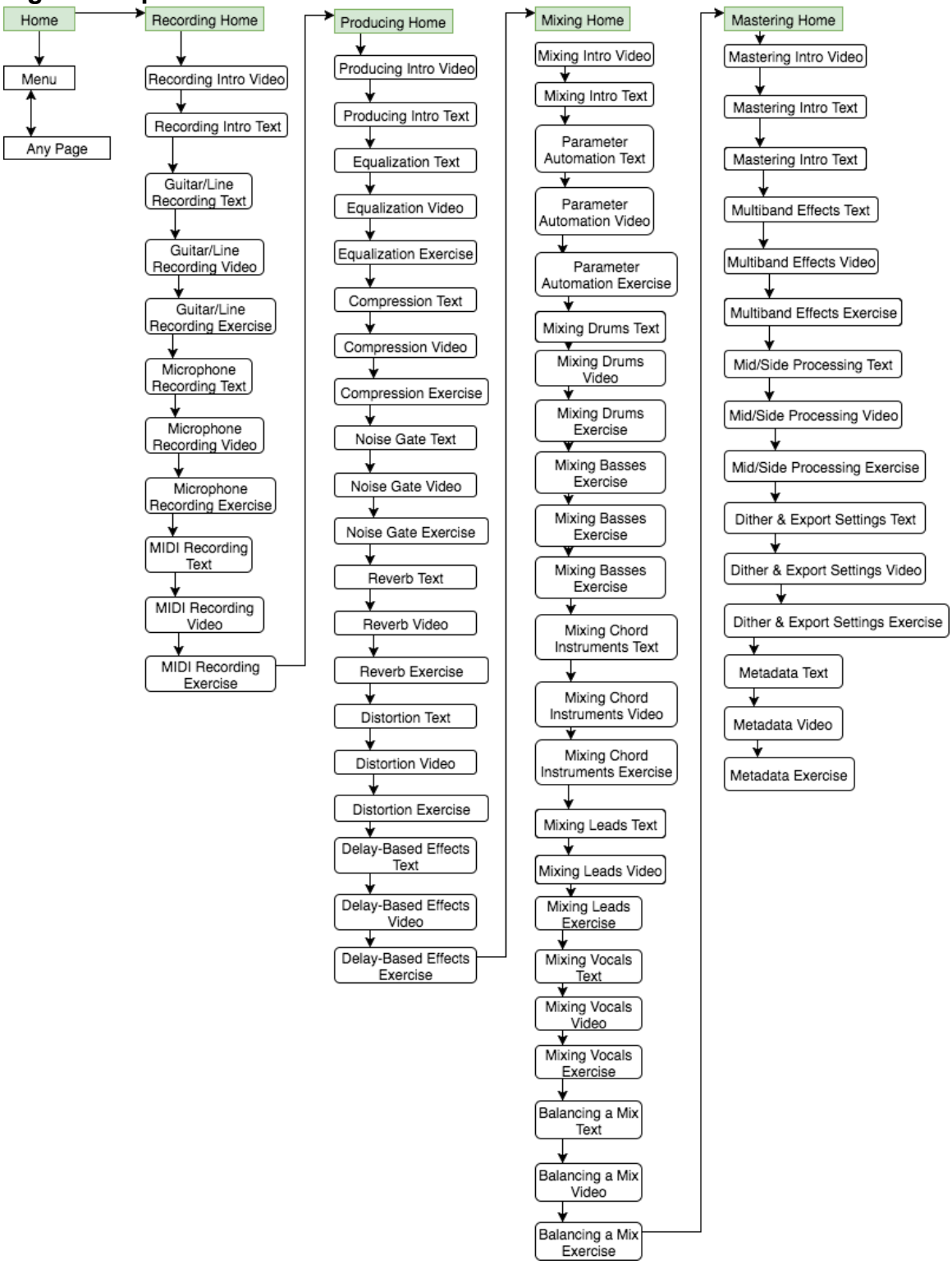
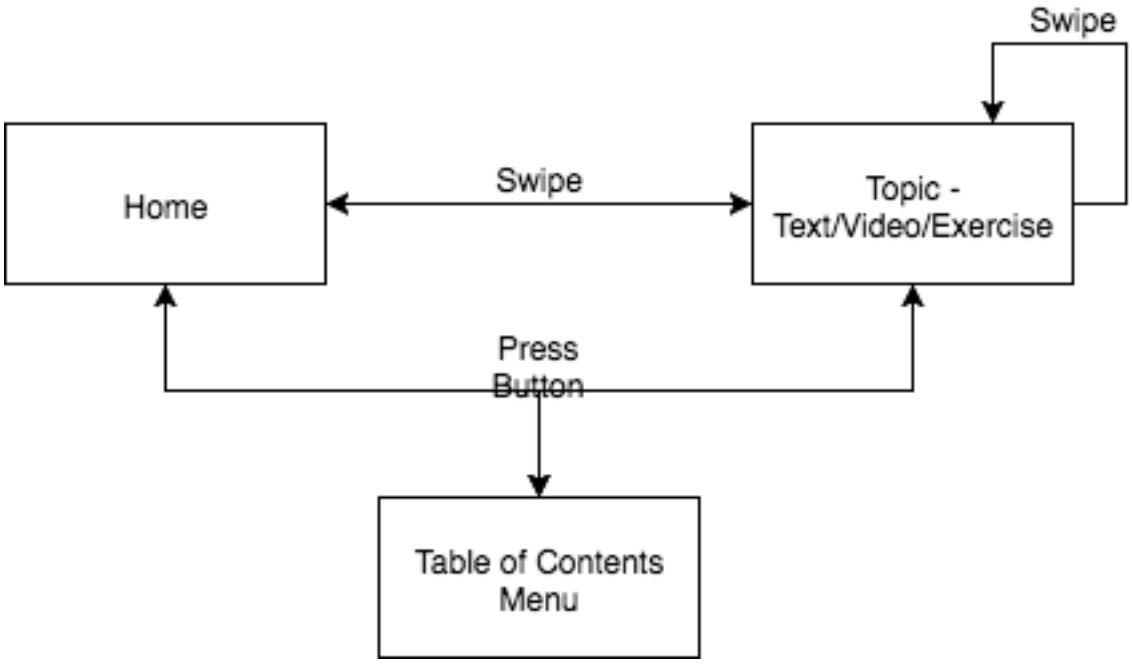


Figure 4: Updated User Flow Diagram



Appendix 2: Design Mockup

Figure 1: Original Home Page

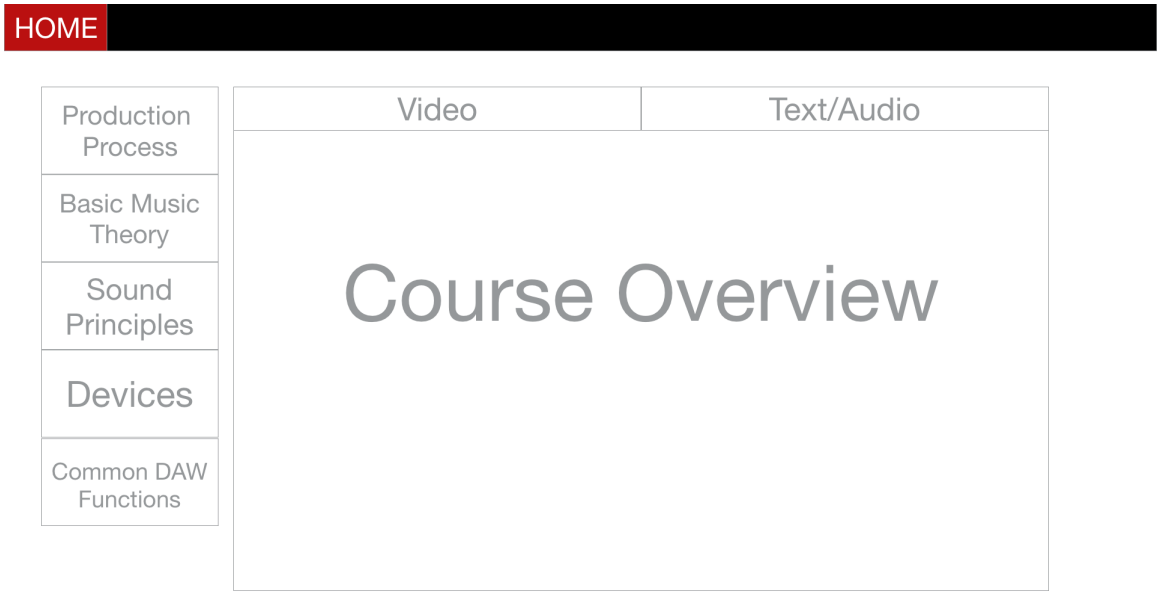


Figure 2: Original Main Topic Page

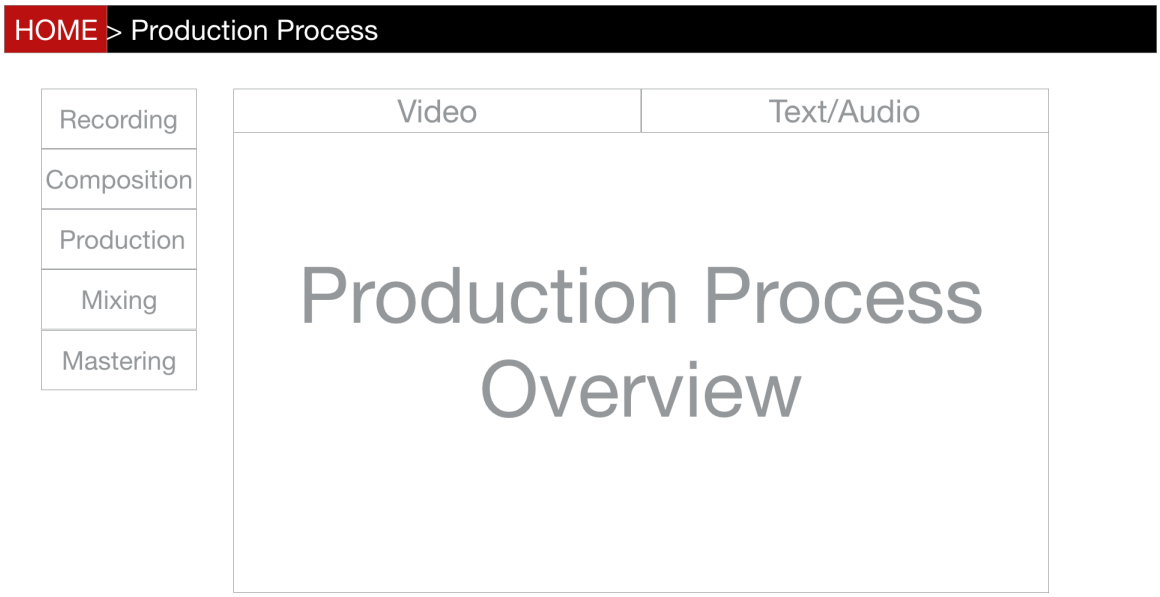


Figure 3: Original Subtopic Page

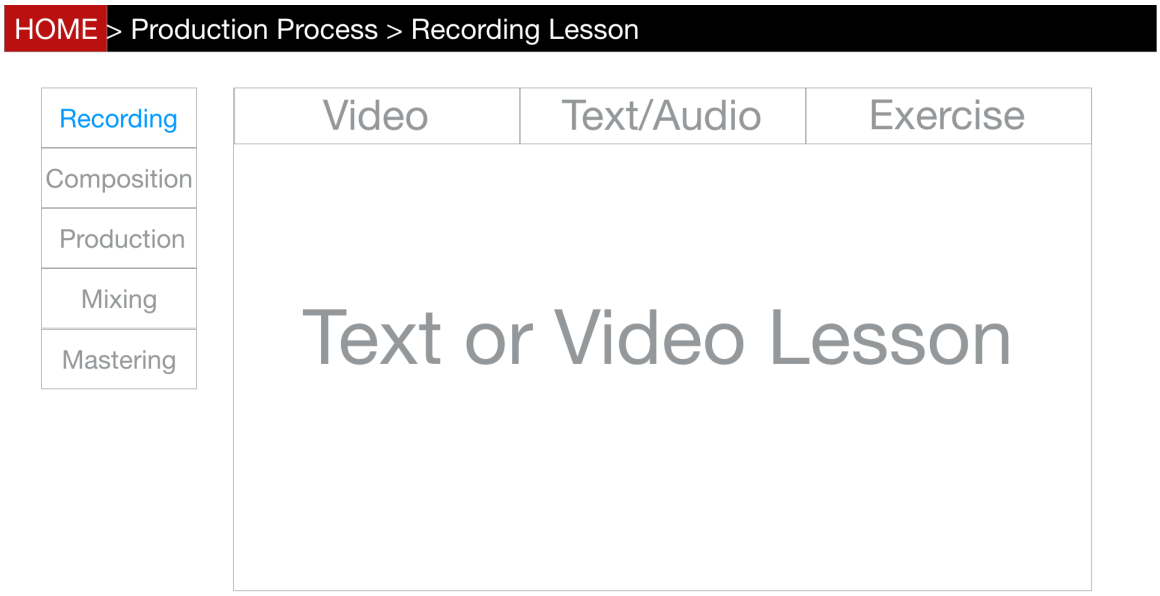


Figure 4: Updated Home Page

Figure 5: Updated Video Page

Figure 6: Updated Text Page

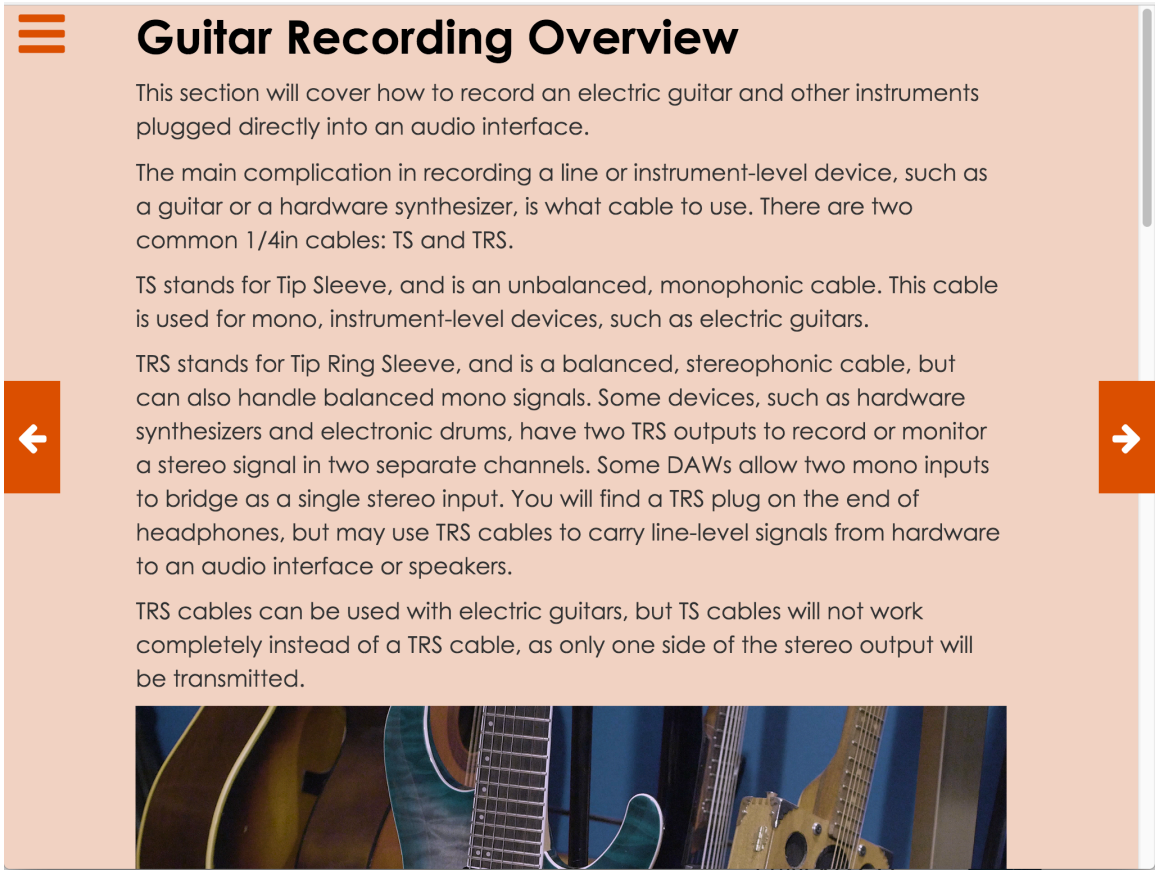
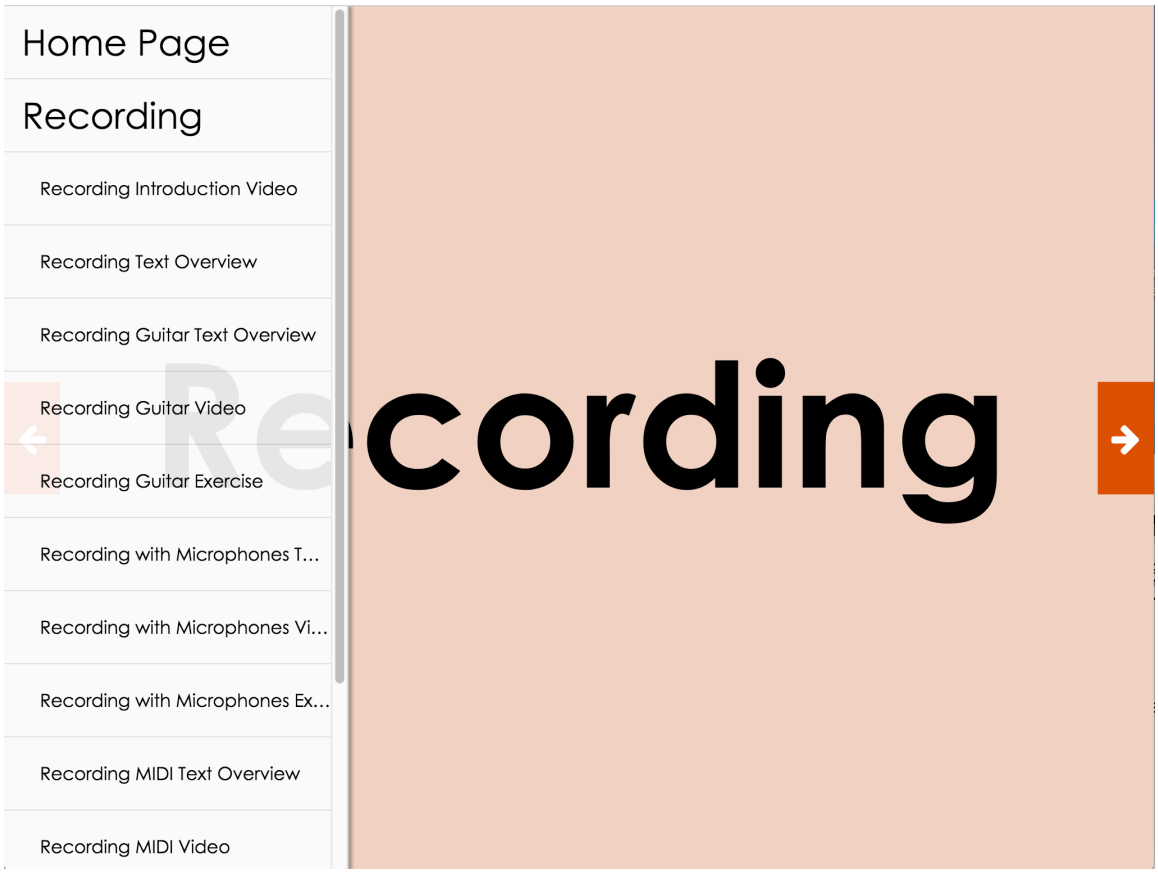


Figure 7: Updated Exercise Page

Figure 8: Updated Table of Contents Menu



Appendix 3: Timeline

Figure 1: Original Project Schedule

Name	Begin date	End date
Design User Interface	1/9/17	3/9/17
Create Working Home Layout	1/9/17	2/7/17
Create Working Lesson Page Layout	1/9/17	2/7/17
Create Working Interactive Exercise Page Layout	1/9/17	2/7/17
Create more attractive buttons & UI	2/8/17	3/9/17
Optimize for Mobile	2/8/17	3/9/17
Design Interactive Exercises	3/9/17	4/5/17
Multiple Choice Exercise	3/9/17	4/5/17
A/B Listening Exercises	3/9/17	4/5/17
Record Video Lessons	1/9/17	3/29/17
Map Out/Script Videos	1/9/17	1/30/17
Record Videos	1/31/17	3/29/17
Create Written Materials x Audio Examples	1/9/17	3/30/17
Write/Edit Text Materials	1/9/17	3/30/17
Record Audio Examples	1/9/17	3/30/17
User Surveying	4/1/17	4/15/17
Text Content	4/1/17	4/15/17
Video Content	4/1/17	4/15/17
Interactive Exercises	4/1/17	4/15/17
User Testing	4/6/17	4/20/17
UI Testing	4/6/17	4/20/17
Interactive Exercise Testing	4/6/17	4/20/17
Content Revisions	4/16/17	5/4/17
Design Revisions	4/21/17	5/4/17

Figure 2: Original Gantt Chart

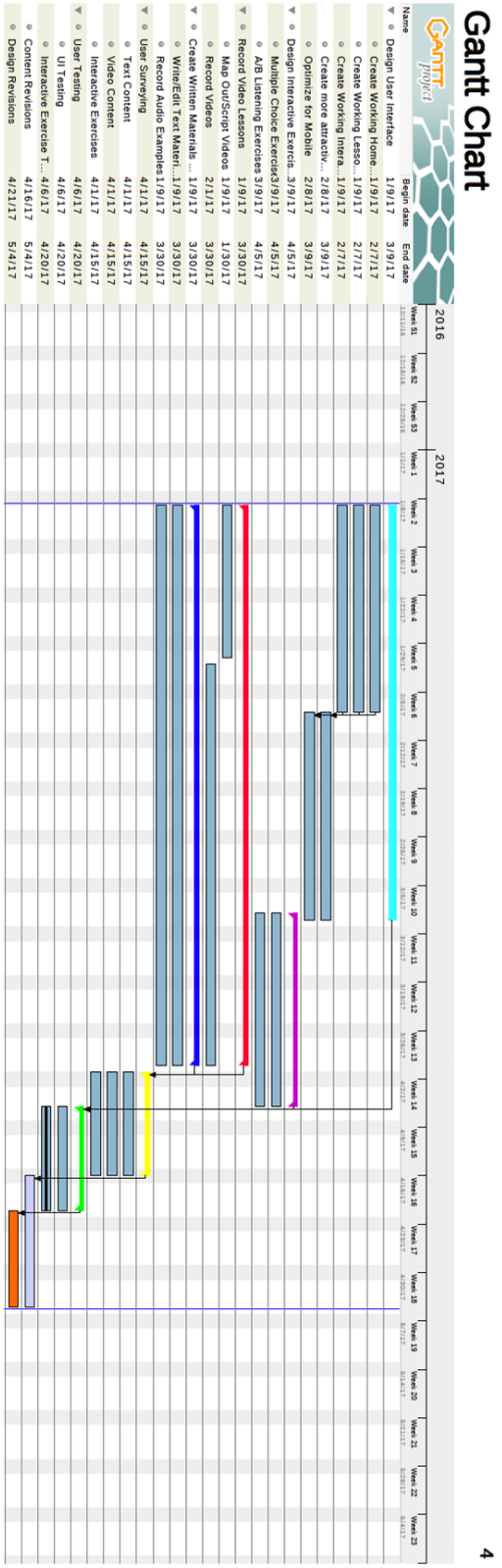
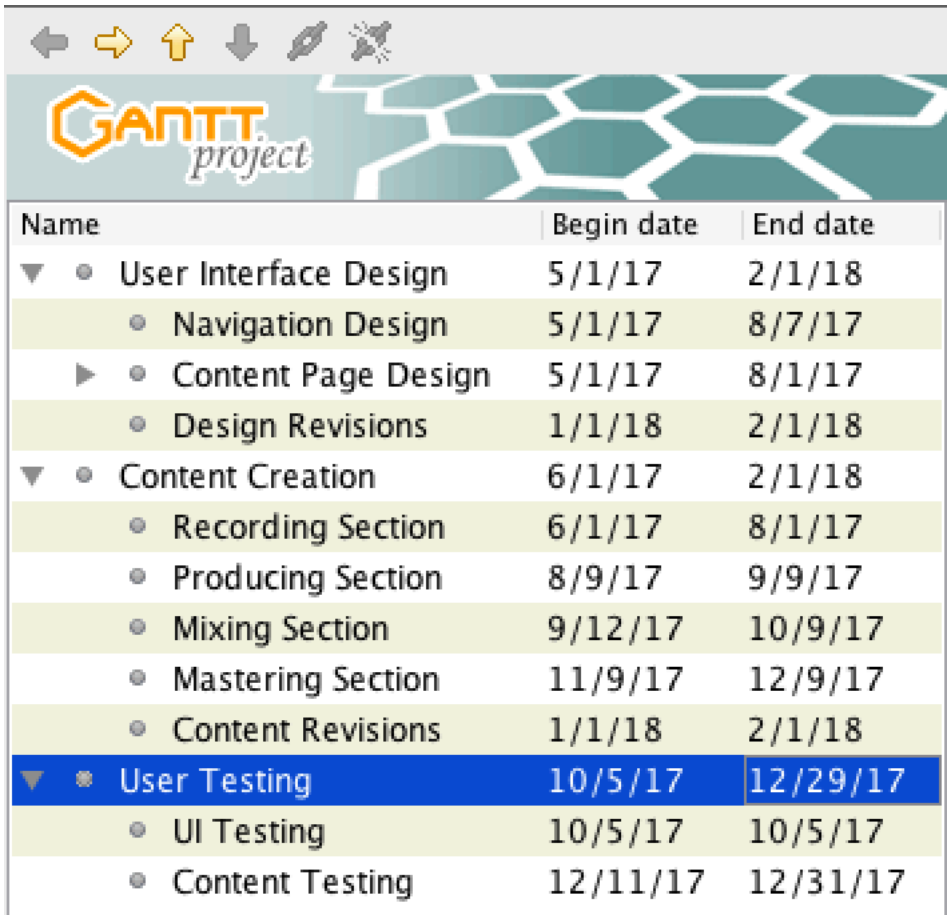
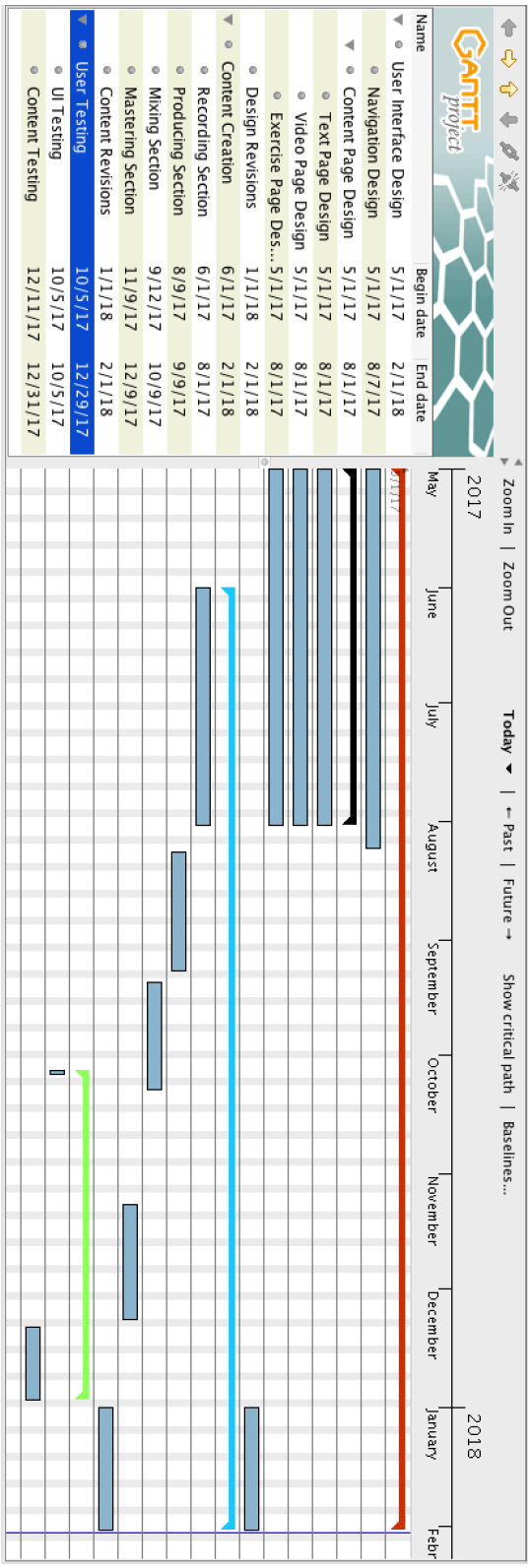


Figure 3: Updated Project Schedule



Name	Begin date	End date
User Interface Design	5/1/17	2/1/18
Navigation Design	5/1/17	8/7/17
Content Page Design	5/1/17	8/1/17
Design Revisions	1/1/18	2/1/18
Content Creation	6/1/17	2/1/18
Recording Section	6/1/17	8/1/17
Producing Section	8/9/17	9/9/17
Mixing Section	9/12/17	10/9/17
Mastering Section	11/9/17	12/9/17
Content Revisions	1/1/18	2/1/18
User Testing	10/5/17	12/29/17
UI Testing	10/5/17	10/5/17
Content Testing	12/11/17	12/31/17

Figure 4: Updated Gantt Chart



Appendix 4: Pilot Study

Figure 1: Initial Survey Questions

- How did you learn to produce music? (check all boxes that apply)
    - Formal school setting
    - Private Lessons
    - Self-paced learning
    - Other
- [If Other] Where else did you learn to produce music?
- How do you prefer to learn music production? (Please be specific)
    - (text box)
- Do you watch music production tutorials online?
    - Yes
    - No
- [If Yes] Where do you primarily view tutorials?
    - (text box)
- [If No] What method(s) have you used to learn music production? (please be specific)
    - (text box)
- How long have you been producing music?
    - Less than 1 year
    - 1 to 5 years
    - More than 5 years
- How do you feel about your music theory knowledge?

  - I don't know any
  - I know some, but am not comfortable with it
  - I know enough to get by
  - I'm fluent in it
  - I'm a master
- Check all boxes of topics of music theory you are comfortable in.
  - Scales
  - Chords
  - Rhythm
  - Notation
  - Basic Piano
- Have you used the Internet to learn Music Theory?
  - Yes
  - No
- Check all boxes of topics of music production you are comfortable in.
  - Recording
  - Composition
  - Production
  - Mixing
  - Mastering
- Check all boxes of topics of effect devices you are comfortable using.
  - EQ/Filter
  - Compressor

    - Noise Gate
    - Reverb
    - Delay
- Have you used the internet to learn how to use effect devices?
    - Yes
    - No
- What DAW do you primarily use?
    - (text box)
- For your preferred DAW, check boxes of topics you feel comfortable in.
    - Transport Functions
    - Channel Types
    - Panning
    - Using Effects
    - Automation/Modulation
- If put in front of another DAW, would you be able to perform a task if you knew the locations of devices and tools?
    - Yes
    - No
- Have you ever taken an online course? (not specifically music production)
    - Yes
    - No
- [If Yes] What did you like about it?
    - (text box)

- [If Yes] What didn't you like about it?
    - (text box)
- [If No] Are you interested in taking an online course?
    - Yes
    - No
- When taking an informative course, do you prefer (check all that apply):
    - Audio Materials
    - Video Materials
    - Interactive Exercises
    - Written Materials
    - Other
- [If Other] You answered 'Other.' What other materials do you enjoy in a course?
    - (text box)
- If you were to take an online course on the fundamentals of music production and the topics addressed in this survey, what other topics would you like to see?
    - (text box)

Figure 2: Initial Survey Answer Notes

How did you learn to produce music?	
Formal School Setting	4
Private Lessons	4
Self-Paced Learning	20
Other (YouTube)	2

How do you prefer to learn music production? (Please be Specific)	
Mentor	6
Tutorials	7
Formal repetitive practice with specific materials	4
Trial and Error	7
Group Setting	6

Do you watch music production tutorials online?	
Yes	20
No	0

If yes, where do you primarily view tutorials?	
YouTube	17
ADSR	4
Other mentions not consistent.	

How long have you been producing music?	
Less than 1 year	1
1 to 5 years	10
More than 5 years	9

How do you feel about your music theory knowledge?	
I don't know any	2
I know some, but am not comfortable with it	4
I know enough to get by	7
I'm fluent in it	6
I'm a master	1

Check all boxes of topics of music theory you are comfortable in.	
Scales	12
Chords	13
Rhythm	15
Notation	6
Basic Piano	14
Not Comfortable with any	1

Have you used the internet to learn Music Theory?	
Yes	11
No	9

Check all boxes of topics of music production you are comfortable in	
Recording	9
Composition	18
Production	18
Mixing	14
Mastering	5

Check all boxes of topics of effect devices you are comfortable in	
EQ/Filter	20
Compressor	18
Noise Gate	11
Reverb	18
Delay	18
Delay-Based Effects	17
Distortion	14

Have you used the internet to learn how to use effects?	
Yes	16
No	0

What DAW do you use?	
Ableton	15
FL Studio	4
Cubase	1
Reason	1
Logic	1
ProTools	1

For your preferred DAW, check boxes of topics you are comfortable in.	
Transport	11
Channel Types	18
Panning	19
Using FX	18
Automation/Modulation	20
Recording Audio	15
Editing Audio	19
Recording MIDI	17
Editing MIDI	19

If put in front of another DAW, would you be able to perform a task if you knew the locations of devices and tools?	
Yes	20
No	0

Have you ever taken an online course? (not specifically about music production)	
Yes	11
No	9

If yes, what did you like about it?	
Material was easily available and easy to refer to at any time	3
Remote and online, thus convenient	1
Self-Paced learning	4
Easy access to a lot of information outside of the course material	1
Visual Instruction	1
Thorough Materials Available	2

If yes, what didn't you like about it?	
No explanation on why something happens	1
Lack of an instructor and feedback	3
Less structured	1
Some tutorials had too much information in a short time	1
Lack of human interaction, felt alienated from complex questions	1
Slightly off topic questions on course material didn't get answered	1
Explaining a topic more than showing it	1
Inability to ask questions	1
'They put me to sleep'	1
Wasn't tailored to individual knowledge or strengths	1

If no, are you interested in taking an online course?	
Yes	8 (of 9)

When taking an informative course, do you prefer (check all that apply):	
Audio	13
Video	19
Interactive Exercises	20
Written	10
Other	0

If you were to take an online course on the fundamentals of music production and the topics addressed in this survey, what other topics would you like to see?	
Mindset tips & tricks to avoid pitfalls in creating songs start to finish and industry advice	1
Sound Design	6
Acoustics	3
Courses about theory, not just production	1
Mastering and recording	1
Panning Effects	1
Advanced sequencing of songs for making it past the second drop	1
Audio Fundamentals	1
Brand Development and Marketing	1

Appendix 5: Project Evaluation

Figure 1: User Interface Survey Questions

- Upon opening the application, do you find it easy to maneuver around the interface?
- Is it easy to navigate between pages by swiping or pressing the arrow keys?
- Does the Table of Contents Menu work properly?
- List any changes or comments you'd like to make about the overall interface layout.
- Navigate to a video page. Do you have any comments about the structure or layout of the video page?
- Navigate to a text page. Do you have any comments about the structure or layout of the text page?
- Navigate to an exercise page. Do you have any comments about the structure or layout of the exercise page?
- Do you have any other comments, questions, or concerns about the application?

Figure 2: Project Content Survey Questions

- Upon completion of the section, did you feel that the (main topic name) was covered?
    - Yes
    - No

- Are any pieces of information mentioned that are unclear? Please use as much detail as possible.
    - (text box)
- Do you feel as if you could explain the (main topic name) process to someone?
    - Yes
    - No
- What was your favorite media type?
    - Video
    - Text
    - Interactive Exercise
    - None
- Why?
    - (text box)
- What was your least favorite media type?
    - Video
    - Text
    - Interactive Exercise
    - None
- Why?
    - (text box)

Appendix 5: Demonstrational Materials

Figure 1: AudioSpark Website
This website contains public promotional materials and information for AudioSpark http://audiosparkapp.com/

Figure 2: AudioSpark Source Code
This source code is available for educational purposes, but is not for public release. Videos have been removed to condense data size.
http://audiosparkapp.com/app/currentbuild.zip

Figure 3: iTunes Store Link
This private link will be the public iTunes App Store link upon release.
https://itunes.apple.com/us/app/audiospark/id1266030272?ls=1&mt=8

Figure 4: Contact Email
In the event the AudioSpark Source Code is not available, please email audiosparkapp@gmail.com.